

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

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**Listing of Claims:**

1. (currently amended) A method to optimally access a memory unit where the memory unit is logically partitioned to form a plurality of memory channels, the plurality  
10 of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

determining at least one load value of each of the plurality of memory channels;

15 and

based on the determined at least one load value, selecting a particular one of the plurality of memory channels;

wherein the step of determining the at least one load value of each of the plurality of memory channels includes determining, for each of the plurality of memory channels,  
20 the number of pending read requests.

2. (canceled)

3. (previously presented) The method of claim 1 wherein the step of selecting the  
25 particular one of the plurality of memory channels includes selecting the particular one of the plurality of memory channels that has a lowest number of pending read requests.

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4. (previously presented) The method of claim 1 wherein the step of determining the at least one load value of each of the plurality of memory channels includes determining, for each of the plurality of memory channels, at least one of the number of pending write requests, and the number of active buffers which is the number of a particular one of the plurality of buffers that is unavailable and corresponds to the particular one of the plurality of memory channels in each of the plurality of memory lines.

5. (previously presented) The method of claim 1 wherein the step of selecting the particular one of the plurality of memory channels includes selecting the particular one of the plurality of memory channels that has at least one of a lowest number of pending write requests, a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme.

6. (previously presented) The method of claim 1 wherein the memory unit is a plurality of dynamic random access memory units.

7. (previously presented) The method of claim 1 wherein each of the plurality of buffers has a fixed-size.

8. (previously presented) The method of claim 7 further comprising receiving an incoming information element;  
if the size of the information element is greater than the fixed-size of each of the plurality of buffers, dividing the information element into a plurality of information element segments, each of the plurality of information element segments having a size less than or equal to the fixed-size of each of the at least one buffer; and  
storing at least one of the information element and a particular one of the plurality of information element segments within a particular one of the plurality of buffers corresponding to the selected one of the plurality of memory channels at a particular one of the plurality of memory lines.

9. (previously presented) The method of claim 1 wherein each of the plurality of memory channels has a width equal to a width of the memory unit divided by the number of the plurality of memory channels.

10. (currently amended) A method to optimally access a memory unit where the memory unit is logically partitioned to form a plurality of memory channels, the plurality of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

determining at least one load value of each of the plurality of memory channels; and

selecting a particular one of the plurality of memory channels that has a particular one of the at least one load value that is the lowest;

wherein the step of determining the at least one load value of each of the plurality of memory channels includes determining, for each of the plurality of memory channels, at least one of the number of pending read requests and the number of pending write requests.

11. (canceled)

12. (currently amended) The method of claim 10 wherein the step of selecting the particular one of the plurality of memory channels that has the lowest determined load includes selecting the particular one of the plurality of memory channels that has at least one of a lowest number of pending read requests and a lowest number of pending write requests, ~~a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme.~~

13. (previously presented) The method of claim 10 wherein the memory unit is a plurality of dynamic random access memory units.

14. (previously presented) The method of claim 10 wherein each of the plurality of buffers has a fixed-size.

15. (currently amended) The method of claim 14 further comprising

5 receiving an incoming information element;

if the size of the information element is greater than the fixed-size of each of the plurality of buffers, dividing the information element into a plurality of information element segments, each of the plurality of information element segments having a size less than or equal to the fixed-size of each of the at least one buffer; and

10 storing at least one of the information element and a particular one of the plurality of information element segments within a particular one of the plurality of buffers  
corresponding to the particular one of the plurality of buffers to the selected one of the plurality of memory channels at a particular one of the plurality of memory lines.

15 16. (previously presented) The method of claim 14 wherein each of the plurality of memory channels has a width equal to a width of the memory unit divided by the number of the plurality of memory channels.

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17. (currently amended) A method to optimally access a single hierarchical level memory unit, where the memory unit is logically partitioned to form a plurality of memory channels, the plurality of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

determining, for each of the plurality of memory channels, ~~at least one of the~~ number of pending read requests, the number of pending write requests, and the number of active buffers which is the number of a particular one of the plurality of buffers that is unavailable and corresponds to the particular one of the plurality of memory channels in each of the plurality of memory lines; and

selecting a particular one of the plurality of memory channels that has at least one of a lowest number of pending read requests, a lowest number of pending write requests, a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme.

18. (previously presented) The method of claim 17 wherein each of the plurality of buffers has a fixed-size.

19. (previously presented) The method of claim 18 further comprising receiving an incoming information element;

if the size of the information element is greater than the fixed-size of each of the plurality of buffers, dividing the information element into a plurality of information element segments, each of the plurality of information element segments having a size less than or equal to the fixed-size of each of the at least one buffer; and

storing at least one of the information element and a particular one of the plurality of information element segments within a particular one of the plurality of buffers corresponding to the selected one of the plurality of memory channels at a particular one of the plurality of memory lines.

20. (previously presented) The method of claim 17 wherein the single hierarchical level memory unit is a plurality of dynamic random access memory units.

21. (previously presented) The method of claim 19 wherein the step of selecting the particular one of the plurality of memory channels includes

finding a first subset of the plurality of memory channels that is available at the particular one of the plurality of memory lines and has a lowest number of the pending read requests;

if the number of memory channels within the first subset of the plurality of memory channels equals one, setting the selected one of the plurality of memory channels to the first subset of the plurality of memory channels;

if the number of memory channels within the first subset of the plurality of memory channels is greater than one, then finding a second subset of the plurality of memory channels within the first subset of the plurality of memory channels that has the lowest number of the pending write requests;

if the number of memory channels within the second subset of the plurality of memory channels equals one, setting the selected one of the plurality of memory channels to the second subset of the plurality of memory channels;

if the number of memory channels within the second subset of the plurality of memory channels is greater than one, then finding a third subset of the plurality of memory channels within the second subset of the plurality of memory channels that has the lowest number of active buffers;

if the number of memory channels within the third subset of the plurality of memory channels equals one, setting the selected one of the plurality of memory channels to the third subset of the plurality of memory channels; and

if the number of memory channels within the third subset of the plurality of memory channels is greater than one, setting the selected one of the plurality of memory channels to a particular one of the third subset of the plurality of memory channels that has a corresponding channel identification number that is next in a round robin scheme.

22. (previously presented) The method of claim 19 wherein the step of selecting the particular one of the plurality of memory channels includes

finding a first subset of the plurality of memory channels that has a lowest number of the pending read requests;

5 if the number of memory channels within the first subset of the plurality of memory channels equals one,

determining if the first subset of the plurality of memory channels at the particular one of the plurality of memory lines is available;

10 if the first subset of the plurality of memory channels at the particular one of the plurality of memory lines is available, setting the selected one of the plurality of memory channels to the first subset of the plurality of memory channels; and

if the first subset of the plurality of memory channels at the particular one of the plurality of memory lines is not available,

15 determining if at least one of the information element and the particular one of the plurality of information element segments can be stored within any remaining one of the plurality of memory channels at the particular one of the plurality of memory lines without overloading that memory channel;

20 if at least one of the information element and the particular one of the plurality of information element segments can be stored within any remaining one of the plurality of memory channels, finding a second subset of the plurality of memory channels that has a next lowest number of the pending read requests; and

25 if at least one of the information element and the particular one of the plurality of information element segments cannot be stored within any remaining one of the plurality of memory channels, fetching a new one of the plurality of memory lines; and

30 if the number of memory channels within the first subset of the plurality of memory channels is greater than one, setting the selected one of the plurality of memory channels to a particular one of the first subset of the plurality of memory channels that has at least one of a lowest number of pending write requests, a lowest

number of active buffers, and a corresponding channel identification number that is next in a round robin scheme.

23. (previously presented) The method of claim 19 further comprising, upon storing  
5 at least one of the information element and the particular one of the plurality of  
information element segments within the particular one of the plurality of buffers  
corresponding to the selected one of the plurality of memory channels; setting a particular  
one of a plurality of payload channel occupancy bits that corresponds to the selected one  
of the plurality of memory channels.

10 24. (previously presented) The method of claim 19 further comprising, reading the  
plurality of payload channel occupancy bits to determine if a corresponding one of the  
plurality of memory channels is available.

15 25. (previously presented) The method of claim 19 further comprising, upon storing  
at least one of the information element and the particular one of the plurality of  
information element segments within the particular one of the plurality of buffers  
corresponding to the selected one of the plurality of memory channels at the particular  
one of the plurality of memory lines, writing a channel identification number  
20 corresponding to the selected one of the plurality of memory channels to a buffer location  
field within a payload channel sequence table that corresponds to the particular one of the  
plurality of buffers.

25 26. (previously presented) The method of claim 25 further comprising, upon storing  
at least one of the information element and the particular one of the plurality of  
information element segments within the particular one of the plurality of buffers  
corresponding to the selected one of the plurality of memory channels at the particular  
one of the plurality of memory lines, setting a value field within the payload channel  
sequence table that corresponds to the particular one of the plurality of buffers.



27. (previously presented) The method of claim 26 further comprising, upon storing at least one of the information element and the particular one of the plurality of information element segments within the particular one of the plurality of buffers corresponding to the selected one of the plurality of memory channels at the particular one of the plurality of memory lines, if the data within the particular one of the plurality of buffers signals an end-of-packet, setting an end-of-packet field corresponding to the particular one of the plurality of buffers within the payload channel sequence table.

28. (previously presented) The method of claim 27 further comprising fetching at least one of the information element and a portion of the information element by determining at least one memory channel that stores at least one of the information element and the portion of the information element by reading the buffer location field corresponding to each of the plurality of buffers at a particular one of the plurality of memory lines until an end-of-packet field corresponding to that buffer signals the end-of-packet; and

reading the contents of each of an at least one buffer of the plurality of buffers at a particular one of the plurality of memory lines corresponding to each of the at least one memory channel.

29. (currently amended) A system to optimally access a memory unit, comprising: the memory unit that is logically partitioned to form a plurality of memory channels;

a traffic analyzer to determine at least one load of each of the plurality of memory channels; and

a bandwidth balancer to select a particular one of the plurality of memory channels based on the determined at least one load;

wherein the traffic analyzer includes:

a plurality of pending write request counters to measure write request loads on the plurality of channels, each of the plurality of pending write request counters corresponds to a separate one of the plurality of write request queues;

a plurality of pending read request counters to measure read request loads on the plurality of channels, each of the plurality of pending read request counters corresponds to a separate one of the plurality of read request queues; and

a plurality of active buffer counters to measure stored data loads on the plurality of channels, each of the plurality of active buffer counters corresponds to a separate one of the plurality of write request queues that in turn corresponds to a particular one of the plurality of memory channels and each of the plurality of active buffer counters also corresponds to a separate one of the plurality of read request queues that in turn corresponds to the particular one of the plurality of memory channels.

30. (previously presented) The system of claim 29 wherein the plurality of memory channels of the memory unit are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels.

31. (previously presented) The system of claim 29 further comprising  
a plurality of write payload channel queues, each of the plurality of write payload channel queues corresponds to a separate one of the plurality of memory channels, each of the plurality of write payload channel queues stores at least one of an information element and a particular one of the information element segments to be written to a corresponding one of the plurality of memory channels;

a plurality of write request queues, each of the plurality of write request queues corresponds to a separate one of the plurality of write payload channel queues, a particular one of the plurality of write request queues stores a request to write the data within a corresponding one of the plurality of write payload channel queues to a corresponding one of the plurality of memory channels of the memory unit;

a plurality of read payload channel queues, each of the plurality of read payload channel queues corresponds to a separate one of the plurality of memory channels, each of the plurality of read payload channel queues stores at least one of an information

element and a particular one of the information element segments that is retrieved from the memory unit; and

a plurality of read request queues, each of the plurality of read request queues corresponds to a separate one of the plurality of read payload channel queues, a particular one of the plurality of read request queues stores a request to retrieve from a  
5 corresponding one of the plurality of memory channels of the memory unit at least one of the information element and the particular one of the information element segments and store it in a corresponding one of the plurality of read payload channel queues.

10 32. (canceled)

33. (currently amended) The system of claim 29 ~~32~~ wherein

a particular one of the plurality of pending write request counters is incremented upon a corresponding one of the plurality of write request queues receiving a write  
15 request and decremented upon extracting the write request from the corresponding one of the plurality of write request queues;

a particular one of the plurality of pending read request counters is incremented upon a corresponding one of the plurality of read request queues receiving a read request and decremented upon extracting the read request from the corresponding one of the  
20 plurality of read request queues; and

a particular one of the plurality of active buffer counters is incremented upon a corresponding one of the plurality of write request queues receiving the write request and decremented upon a corresponding one of the plurality of read request queues receiving the read request.

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34. (currently amended) The system of claim 30 ~~29~~ further comprising a payload channel occupancy vector, each element of the payload channel occupancy vector corresponds to a separate one of the plurality of buffers at a particular one of the plurality of memory lines and each element of the payload channel occupancy vector indicates if a  
30 corresponding one of the plurality of memory buffers is available.

35. (currently amended) The system of claim 29 further comprising a payload channel sequence table to specify ~~an~~ at least one memory channel of the plurality of memory channels at which at least one of the information element and a portion of the information element is stored.

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36. (previously presented) The system of claim 35 wherein the payload channel sequence table is partitioned to form a plurality of columns, each of the plurality of columns corresponds to a separate one of the plurality of memory channels, the plurality of columns are further partitioned to form a plurality of rows, each of the plurality of rows includes a plurality of buffer information units and each of the plurality of buffer information units includes

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a buffer location field that specifies a particular one of the plurality of memory channels at which a particular one of the plurality of buffers at a particular one of the plurality of memory lines stores at least one of the information element and a particular one of the plurality of information element segments;

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a value field that indicates whether the particular one of the plurality of buffers corresponding to the particular one of the plurality of memory channels at the particular one of the plurality of memory lines stores any data within that buffer; and

an end-of-packet field that indicates whether the particular one of the plurality of buffers corresponding to the particular one of the plurality of memory channels at the particular one of the plurality of memory lines stores data that signals an end-of-packet.

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37. (previously presented) The system of claim 29 wherein the memory unit is a plurality of dynamic random access memory units.

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38. (previously presented) The system of claim 30 further comprising a buffer management unit to provide a pointer to a new one of the plurality of memory lines.

39. (previously presented) The system of claim 29 wherein each of the plurality of buffers has a length that is a fixed-size.

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40. (previously presented) The system of claim 39 wherein each of the plurality of memory channels has a width that is the fixed-size.

41. (currently amended) A system to optimally access a memory unit, comprising:  
5 the memory unit that is logically partitioned to form a plurality of memory channels;

a bandwidth management unit that includes

a traffic analyzer to determine at least one load of each of the plurality of memory channels; and

10 a bandwidth balancer to select a particular one of the plurality of memory channels based on the determined at least one load; and

a policy control unit to provide at least one of an information element and a particular one of a plurality of information element segments for writing to the selected one of the plurality of memory channels;

15 a data buffer unit to temporarily store at least one of the information element and the particular one of the plurality of information element segments within a particular one of a plurality of write payload channel queues that corresponds to the selected one of the plurality of memory channels and writes the temporarily stored data to the selected one of the plurality of memory channels within the memory unit; and

20 a forward processing unit that fetches at least one buffer of the plurality of buffers within the memory unit.

42. (canceled)

25 43. (currently amended) The system of claim 41 42-wherein the forward processing unit includes

a plurality of read payload channel queues, each of the plurality of read payload channel queues corresponds to a separate one of the plurality of memory channels, each of the plurality of read payload channel queues stores at least one of an information  
30 element and a particular one of the information element segments that is retrieved from the memory unit; and

a plurality of read request queues, each of the plurality of read request queues corresponds to a separate one of the plurality of read payload channel queues, a particular one of the plurality of read request queues stores a request to retrieve from a corresponding one of the plurality of memory channels of the memory unit at least one of the information element and the particular one of the information element segments and store it in a corresponding one of the plurality of read payload channel queues.

44. (previously presented) The system of claim 43 further comprising a payload channel sequence table to specify an at least one memory channel of the plurality of memory channels at which at least one of the information element and a portion of the information element is stored.

45. (previously presented) The system of claim 43 wherein the forward processing unit fetches at least one of the information element and the portion of the information element by

accessing the payload channel sequence table to determine at least one memory channel within which at least one of the information element and the portion of the information element is stored, and

for each of the at least one memory channel, sending a read request to a particular one of the plurality of read request queues that corresponds to that memory channel.

46. (previously presented) The system of claim 44 wherein the payload channel sequence table is partitioned to form a plurality of columns, each of the plurality of columns corresponds to a separate one of the plurality of memory channels, the plurality of columns are further partitioned to form a plurality of rows, each of the plurality of rows includes a plurality of buffer information units and each of the plurality of buffer information units includes

a buffer location field that specifies a particular one of the plurality of memory channels at which a particular one of the plurality of buffers at a particular one of the plurality of memory lines stores at least one of the information element and a particular one of the plurality of information element segments;

a value field that indicates whether the particular one of the plurality of buffers corresponding to the particular one of the plurality of memory channels at the particular one of the plurality of memory lines stores any data within that buffer; and

an end-of-packet field that indicates whether the particular one of the plurality of buffers corresponding to the particular one of the plurality of memory channels at the particular one of the plurality of memory lines stores data that signals an end-of-packet.

47. (previously presented) The system of claim 46 wherein the forward processing unit fetches at least one of the information element and the portion of the information element by

determining at least one memory channel that stores the at least one of the information element and the portion of the information element by traversing each of the plurality of buffer information units within a particular one of the plurality of rows of the payload channel sequence table and retrieving the particular one of the plurality of memory channels specified within the buffer location field until the end-of-packet field of that buffer information unit signals the end-of-packet; and

for each of the at least one memory channel, sending a read request to a particular one of the plurality of read request queues that corresponds to that memory channel.

48. (currently amended) A program storage device readable by a computer system, storing a plurality of instructions to optimally access a memory unit where the memory unit is logically partitioned to form a plurality of memory channels, the plurality of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

instructions for determining at least one load value of each of the plurality of memory channels; and

instructions for selecting a particular one of the plurality of memory channels based on the determined at least one load value;

wherein the instructions for determining the at least one load value of each of the plurality of memory channels includes instructions for determining, for each of the plurality of memory channels, the number of pending read requests, the number of pending write requests, and the number of active buffers which is the number of a particular one of the plurality of buffers that is unavailable and corresponds to the particular one of the plurality of memory channels in each of the plurality of memory lines.

49. (canceled)

50. (previously presented) The device of claim 48 wherein the instructions for selecting the particular one of the plurality of memory channels includes instructions for selecting the particular one of the plurality of memory channels that has at least one of a lowest number of pending read requests, a lowest number of pending write requests, a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme.

51. (new) A method to optimally access a single hierarchical level memory unit, where the memory unit is logically partitioned to form a plurality of memory channels, the plurality of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

determining, for each of the plurality of memory channels, at least one of the number of pending read requests, the number of pending write requests, and the number of active buffers which is the number of a particular one of the plurality of buffers that is unavailable and corresponds to the particular one of the plurality of memory channels in each of the plurality of memory lines; and

selecting a particular one of the plurality of memory channels that has at least one of a lowest number of pending read requests, a lowest number of pending write requests,



a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme;

wherein each of the plurality of buffers has a fixed-size; and  
further comprising

5 receiving an incoming information element;

if the size of the information element is greater than the fixed-size of each of the plurality of buffers, dividing the information element into a plurality of information element segments, each of the plurality of information element segments having a size less than or equal to the fixed-size of each of the at least one buffer; and

10 storing at least one of the information element and a particular one of the plurality of information element segments within a particular one of the plurality of buffers corresponding to the selected one of the plurality of memory channels at a particular one of the plurality of memory lines;

wherein the step of selecting the particular one of the plurality of memory  
15 channels includes

finding a first subset of the plurality of memory channels that is available at the particular one of the plurality of memory lines and has a lowest number of the pending read requests;

if the number of memory channels within the first subset of the plurality of  
20 memory channels equals one, setting the selected one of the plurality of memory channels to the first subset of the plurality of memory channels;

if the number of memory channels within the first subset of the plurality of memory channels is greater than one, then finding a second subset of the plurality of memory channels within the first subset of the plurality of memory channels that has the  
25 lowest number of the pending write requests;

if the number of memory channels within the second subset of the plurality of memory channels equals one, setting the selected one of the plurality of memory channels to the second subset of the plurality of memory channels;

if the number of memory channels within the second subset of the  
30 plurality of memory channels is greater than one, then finding a third subset of the

plurality of memory channels within the second subset of the plurality of memory channels that has the lowest number of active buffers;

if the number of memory channels within the third subset of the plurality of memory channels equals one, setting the selected one of the plurality of memory

5 channels to the third subset of the plurality of memory channels; and

if the number of memory channels within the third subset of the plurality of memory channels is greater than one, setting the selected one of the plurality of memory channels to a particular one of the third subset of the plurality of memory channels that has a corresponding channel identification number that is next in a round robin scheme.

52. (new) A method to optimally access a single hierarchical level memory unit, where the memory unit is logically partitioned to form a plurality of memory channels, the plurality of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

determining, for each of the plurality of memory channels, at least one of the number of pending read requests, the number of pending write requests, and the number of active buffers which is the number of a particular one of the plurality of buffers that is unavailable and corresponds to the particular one of the plurality of memory channels in each of the plurality of memory lines; and

selecting a particular one of the plurality of memory channels that has at least one of a lowest number of pending read requests, a lowest number of pending write requests, a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme;

wherein each of the plurality of buffers has a fixed-size; and further comprising

receiving an incoming information element;

if the size of the information element is greater than the fixed-size of each of the plurality of buffers, dividing the information element into a plurality of information

element segments, each of the plurality of information element segments having a size less than or equal to the fixed-size of each of the at least one buffer; and

storing at least one of the information element and a particular one of the plurality of information element segments within a particular one of the plurality of buffers

5 corresponding to the selected one of the plurality of memory channels at a particular one of the plurality of memory lines;

wherein the step of selecting the particular one of the plurality of memory channels includes

10 finding a first subset of the plurality of memory channels that has a lowest number of the pending read requests;

if the number of memory channels within the first subset of the plurality of memory channels equals one,

determining if the first subset of the plurality of memory channels at the particular one of the plurality of memory lines is available;

15 if the first subset of the plurality of memory channels at the particular one of the plurality of memory lines is available, setting the selected one of the plurality of memory channels to the first subset of the plurality of memory channels; and

if the first subset of the plurality of memory channels at the particular one of the plurality of memory lines is not available,

20 determining if at least one of the information element and the particular one of the plurality of information element segments can be stored within any remaining one of the plurality of memory channels at the particular one of the plurality of memory lines without overloading that memory channel;

25 if at least one of the information element and the particular one of the plurality of information element segments can be stored within any remaining one of the plurality of memory channels, finding a second subset of the plurality of memory channels that has a next lowest number of the pending read requests; and

30 if at least one of the information element and the particular one of the plurality of information element segments cannot be stored within

any remaining one of the plurality of memory channels, fetching a new one of the plurality of memory lines; and

if the number of memory channels within the first subset of the plurality of memory channels is greater than one, setting the selected one of the plurality of memory channels to a particular one of the first subset of the plurality of memory channels that has at least one of a lowest number of pending write requests, a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme.

53. (new) A method to optimally access a single hierarchical level memory unit, where the memory unit is logically partitioned to form a plurality of memory channels, the plurality of memory channels are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels, comprising:

determining, for each of the plurality of memory channels, at least one of the number of pending read requests, the number of pending write requests, and the number of active buffers which is the number of a particular one of the plurality of buffers that is unavailable and corresponds to the particular one of the plurality of memory channels in each of the plurality of memory lines; and

selecting a particular one of the plurality of memory channels that has at least one of a lowest number of pending read requests, a lowest number of pending write requests, a lowest number of active buffers, and a corresponding channel identification number that is next in a round robin scheme;

wherein each of the plurality of buffers has a fixed-size; and further comprising

receiving an incoming information element;

if the size of the information element is greater than the fixed-size of each of the plurality of buffers, dividing the information element into a plurality of information element segments, each of the plurality of information element segments having a size less than or equal to the fixed-size of each of the at least one buffer; and

storing at least one of the information element and a particular one of the plurality of information element segments within a particular one of the plurality of buffers corresponding to the selected one of the plurality of memory channels at a particular one of the plurality of memory lines;

5 further comprising, upon storing at least one of the information element and the particular one of the plurality of information element segments within the particular one of the plurality of buffers corresponding to the selected one of the plurality of memory channels at the particular one of the plurality of memory lines, writing a channel identification number corresponding to the selected one of the plurality of memory  
10 channels to a buffer location field within a payload channel sequence table that corresponds to the particular one of the plurality of buffers.

54. (new) A system to optimally access a memory unit, comprising:

the memory unit that is logically partitioned to form a plurality of memory  
15 channels;

a traffic analyzer to determine at least one load of each of the plurality of memory channels;

a bandwidth balancer to select a particular one of the plurality of memory channels based on the determined at least one load;

20 a plurality of write payload channel queues, each of the plurality of write payload channel queues corresponds to a separate one of the plurality of memory channels, each of the plurality of write payload channel queues stores at least one of an information element and a particular one of the information element segments to be written to a corresponding one of the plurality of memory channels;

25 a plurality of write request queues, each of the plurality of write request queues corresponds to a separate one of the plurality of write payload channel queues, a particular one of the plurality of write request queues stores a request to write the data within a corresponding one of the plurality of write payload channel queues to a corresponding one of the plurality of memory channels of the memory unit;

30 a plurality of read payload channel queues, each of the plurality of read payload channel queues corresponds to a separate one of the plurality of memory channels, each

of the plurality of read payload channel queues stores at least one of an information element and a particular one of the information element segments that is retrieved from the memory unit; and

a plurality of read request queues, each of the plurality of read request queues corresponds to a separate one of the plurality of read payload channel queues, a particular one of the plurality of read request queues stores a request to retrieve from a corresponding one of the plurality of memory channels of the memory unit at least one of the information element and the particular one of the information element segments and store it in a corresponding one of the plurality of read payload channel queues.

55. (new) A system to optimally access a memory unit, comprising:  
the memory unit that is logically partitioned to form a plurality of memory channels;

a traffic analyzer to determine at least one load of each of the plurality of memory channels; and

a bandwidth balancer to select a particular one of the plurality of memory channels based on the determined at least one load;

wherein the plurality of memory channels of the memory unit are further logically partitioned to form a plurality of memory lines, each of the plurality of memory lines includes a plurality of buffers and each of the plurality of buffers corresponds to a separate one of the plurality of memory channels; and

further comprising a payload channel occupancy vector, each element of the payload channel occupancy vector corresponds to a separate one of the plurality of buffers at a particular one of the plurality of memory lines and each element of the payload channel occupancy vector indicates if a corresponding one of the plurality of memory buffers is available.

56. (new) A system to optimally access a memory unit, comprising:  
the memory unit that is logically partitioned to form a plurality of memory  
channels;

a traffic analyzer to determine at least one load of each of the plurality of memory  
5 channels;

a bandwidth balancer to select a particular one of the plurality of memory  
channels based on the determined at least one load; and

a payload channel sequence table to specify an at least one memory channel of the  
plurality of memory channels at which at least one of the information element and a  
10 portion of the information element is stored.

57. (new) A system to optimally access a memory unit, comprising:  
the memory unit that is logically partitioned to form a plurality of memory  
channels;

15 a traffic analyzer to determine at least one load of each of the plurality of memory  
channels;

a bandwidth balancer to select a particular one of the plurality of memory  
channels based on the determined at least one load;

wherein the plurality of memory channels of the memory unit are further logically  
20 partitioned to form a plurality of memory lines, each of the plurality of memory lines  
includes a plurality of buffers and each of the plurality of buffers corresponds to a  
separate one of the plurality of memory channels; and

further comprising a buffer management unit to provide a pointer to a new one of  
the plurality of memory lines.